Notice of Allowability	Application No.	Applicant(s)	
	10/027,309	LESLIE, HARRY ANTHONY	
	Examiner	Art Unit	
	Isaac M. Woo	2162	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *response filed on 04/11/2005*.

2. ☒ The allowed claim(s) is/are *21, 23-30, 32-37, 39 and 41*.

3. ☒ The drawings filed on *03 August 2004* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

JEAN M. CORRIELUS
PRIMARY EXAMINER

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 11, 2005 has been entered.

2. Claims 21, 33, 35-37 and 41 are amended. Claims 1-20, 22, 31, 40 are canceled. The pending claims are 21, 23-30, 32-39, 41 and 43.

EXAMINER'S AMENDMENT

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Alan D. Christenson (Reg. No. 54,036) on June 16, 2005.

The application has been amended as follows:

Rewrite claim 21, as follows:

"21. A computer-implemented method for optimizing a database management system process of a query, the method comprising:

collecting a plurality of single column statistics for a plurality of columns, the plurality of single column statistics providing estimates for row counts and unique entry counts for a sinlge column operator;

determining a first selectivity estimate as if the columns are substantially independent of each other;

determining a second selectivity estimate as if the columns are substantially dependent on each other;

determining a third selectivity estimate for predicates in the query using the first and second selectivity estimates, the third selectivity estimate being used in optimizing processing of the query by the database management system;

wherein determining each of the first and second selectivity estimates comprises determining a cross product from the single column statistics;

wherein determining the third selectivity comprises determining a measure of dependency between at least two columns; and

wherein the third selectivity estimate is calculated based on the measure of dependency and a difference between the first and second selectivity estimates."

Rewrite claim 32, as follows:

"32. A computer-implemented method for optimizing a database management system process of a query, the method comprising:

collecting a plurality of single column statistics for a plurality of columns, the plurality of single column statistics providing estimates for row counts and unique entry counts for a sinlge column operator;

determining a first selectivity estimate as if the columns are substantially independent of each other;

determining a first factor as a measure of a skew of the plurality of columns and as a measure of a dependence of a plurality of the columns; and

determining a second selectivity estimate for predicates in the query using the first selectivity estimate and the first factor, the second selectivity estimate being used in optimizing processing of the query by the database management system;

wherein the first factor is determined by

computing a product of unique entry count selectivities from a sum of maximum unique entry counts for the plurality of columns,

computing a product of maximum initial unique entry counts for the plurality of columns,

computing a ratio of the product of unique entry count selectivities and the product of maximum initial entry counts,

selecting a maximum multicolumn unique entry count from multicolumn entry counts for the plurality of columns, and

computing the first factor from a product of the ratio and an inverse of the maximum multicolumn unique entry count."

Rewrite claim 37, as follows:

"37. A data processing system, comprising:

a processor;

a memory coupled to the processor; and

wherein the memory stores a compiler that, when executed by the processor, determines a join selectivity value of columns based on a first selectivity value computed as if the two columns are dependent and a second selectivity value computed as if the two columns are independent,

wherein the compiler performs a join operation based on the join selectivity value,

wherein the compiler determines an intermediate selectivity value approximately halfway between the first selectivity value and the second selectivity value when a dependence between the two columns is unknown and wherein the compiler performs the join operation based on the intermediate selectivity value, and

wherein the compiler determines the join selectivity of two columns further based on a cross product of row counts estimated for each of the two columns."

Rewrite claim 41, as follows:

"41. A storage medium containing computer-readable instructions that are executable by a computer and cause the computer to:

produce a query tree based on a query posed by a computer language statement;

transform the query tree into a form that represents a number of logically equivalent methods of processing the computer language statement; and

estimate a cost associated with carrying out each of the logically equivalent methods,

wherein said estimate the cost comprises determining a join selectivity for two columns based on a first selectivity value computed as if the two columns are dependent, a second selectivity value computed as if the two columns are independent and, when an independence of the two columns is unknown, an intermediate value between the first selectivity value and the second selectivity value, and

wherein said determining the join selectivity for two columns is further based on a skew calculation that provides a correction if the two columns have different row count to unique entry count ratios."

Cancel claims 38 and 43.

Now pending claims are 21, 23-30, 32-37, 39 and 41.

Allowable Subject Matter

4. Claims 21, 23-30, 32-37, 39 and 41 are allowed.

Reason For Indicating Allowable Subject Matter

5. The following is a statement of reasons for the indication of allowable subject matter: Claim 21 identifies distinct features, the computer-implemented method for optimizing a database management system process of a query. The closest prior art Chaudhuri et al (U.S. Patent No. 6,529,901) discloses, collecting a plurality of single column statistics for a plurality of columns, the plurality of single column statistics providing estimates for row counts and unique entry counts for a singe column operator. The prior art does not address computer-implemented method for determining a first selectivity estimate the columns are substantially independent of each other, determining a second selectivity estimate the columns are substantially dependent on each other, determining a third selectivity estimate for predicates in the query using the first and second selectivity estimates, the third selectivity estimate being used in optimizing processing of the query by the database management system, determining each of the first and second selectivity estimates comprises determining a cross product from the single column statistics, determining the third selectivity comprises determining a measure of dependency between at least two columns, and the third selectivity estimate is calculated based on the measure of dependency and a difference between

the first and second selectivity estimates. Claim 32 identifies distinct features, the computer-implemented method for optimizing a database management system process of a query. The closest prior art Chaudhuri et al (U.S. Patent No. 6,529,901) discloses, collecting a plurality of single column statistics for a plurality of columns, the plurality of single column statistics providing estimates for row counts and unique entry counts for a singe column operator. The prior art does not address computer-implemented method for determining a first selectivity estimate the columns are substantially independent of each other, determining a first factor as a measure of a skew of the plurality of columns and as a measure of a dependence of a plurality of the columns, determining a second selectivity estimate for predicates in the query using the first selectivity estimate and the first factor, the second selectivity estimate being used in optimizing processing of the query by the database management system, the first factor is determined by computing a product of unique entry count selectivities from a sum of maximum unique entry counts for the plurality of columns, computing a product of maximum initial unique entry counts for the plurality of columns, computing a ratio of the product of unique entry count selectivities and the product of maximum initial entry counts, selecting a maximum multicolumn unique entry count from multicolumn entry counts for the plurality of columns, computing the first factor from a product of the ratio and an inverse of the maximum multicolumn unique entry count. Claim 37 identifies distinct features, the data processing system for optimizing a database management system process of a query. The prior art does not address data processing system for determines a join selectivity value of columns based on a first selectivity value computed as if the two columns are

dependent and a second selectivity value computed as if the two columns are independent, the compiler performs a join operation based on the join selectivity value, determines an intermediate selectivity value approximately halfway between the first selectivity value and the second selectivity value when a dependence between the two columns is unknown, performs the join operation based on the intermediate selectivity value, and determines the join selectivity of two columns further based on a cross product of row counts estimated for each of the two columns. Regards to claim 41, the prior art does not address, produce a query tree based on a query posed by a computer language statement, transform the query tree into a form that represents a number of logically equivalent methods of processing the computer language statement, estimate a cost associated with carrying out each of the logically equivalent methods, the estimate the cost comprises determining a join selectivity for two columns based on a first selectivity value computed as if the two columns are dependent, a second selectivity value computed as if the two columns are independent, when an independence of the two columns is unknown, an intermediate value between the first selectivity value and the second selectivity value, the determining the join selectivity for two columns is further based on a skew calculation that provides a correction if the two columns have different row count to unique entry count ratios. Chaudhuri et al (U.S. Patent No. 6,529,901) fails to suggest the claimed limitation as mentioned above in combination with other limitations of the dependent and independent claims. The claims 21, 23-30, 32-37, 39 and 41 are hereby allowed.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Isaac M. Woo whose telephone number is (571) 272-4043. The examiner can normally be reached on 8:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Breene can be reached on (571) 272-4107. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

IMW
June 28, 2005

JEAN M. CORRIELUS
PRIMARY EXAMINER